

Notice of Allowability

Application No.

10/045,895

Examiner

Hsien-Ming Lee

Applicant(s)

PARK, STEPHEN KEETAI

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/2/03.
2. ☒ The allowed claim(s) is/are 1-20, 41 and 42.
3. ☒ The drawings filed on 29 October 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.
5. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
 - (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
8. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No. _____.
 - (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
 - (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the margin according to 37 CFR 1.121(d).

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| 1 <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5 <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2 <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6 <input type="checkbox"/> Interview Summary (PTO-413), Paper No. _____ |
| 3 <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No. _____ | 7 <input type="checkbox"/> Examiner's Amendment/Comment |
| 4 <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8 <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9 <input type="checkbox"/> Other |

DETAILED ACTION

Remarks

1. The objection to claim 1 and double patenting rejection are withdrawn.
2. Claims 1-20, 41 and 42 are pending in the application.

Allowable Subject Matter

3. Claims 1-20, 41 and 42 are allowed.
4. The following is an examiner's statement of reasons for allowance:

The prior art of record, Boeck et al. to US 5880,018, teach a method of forming a copper interconnect, the method comprising:

- * forming a first sacrificial dielectric layer 18 above a structure layer 16/12 (Fig. 1);
- * forming an opening in the first sacrificial dielectric layer 18;
- * forming at least one barrier metal layer (Ta, col. 4, lines 20-28) above the first sacrificial dielectric layer 18 and in the opening;
- * depositing copper layer above the at least one barrier metal layer (Ta) in the opening;
- * forming the copper interconnect by removing the copper layer and the at least one barrier metal layer above the first sacrificial dielectric layer 18 by CMP technique, leaving the copper interconnect 20 in the opening (Fig. 3);
- * removing the first sacrificial dielectric layers 18 above the structure layer 16/12 and adjacent the copper interconnect 20 (Fig. 4); and
- * forming a low dielectric constant dielectric layer 22 by chemical vapor deposition above the structure layer 16/12 and adjacent the copper interconnect 20 (Fig. 5).

Art Unit: 2823

In contrast, the cited prior art neither teaches nor suggests forming a *second* sacrificial dielectric layer *above the first* sacrificial dielectric layer; forming an *opening* in the *second* sacrificial dielectric layer; forming the copper interconnect by removing portions of the copper layer *above the second* sacrificial dielectric layer; forming the second sacrificial dielectric layer out of one of an oxide, an oxynitride, silicon dioxide, a nitrogen-bearing oxide, a nitrogen-doped oxide, silicon oxynitride, a high dielectric constant (high K) material, wherein K is at least about 8; and forming a first sacrificial dielectric layer *adjacent an intermetal via connect*.

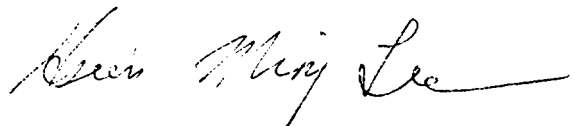
5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
Art Unit 2823



Dec. 21, 2003